

**RULES
OF
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF RADIOLOGICAL HEALTH**

**CHAPTER 1200-2-11
LICENSING REQUIREMENTS FOR LAND DISPOSAL OF RADIOACTIVE WASTE**

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1200-2-11-.01 PURPOSE

The regulations in this Chapter establish, for land disposal of radioactive waste, the procedures, criteria, and terms and conditions upon which the Department issues licenses for the disposal of radioactive wastes received from other persons.

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.02 SCOPE

The regulations in this Chapter do not apply to disposal of high level waste, disposal of uranium or thorium tailings or disposal of licensed material as provided for in Chapter 1200-2-5 by an individual licensee.

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.03 DEFINITIONS

- (1) Active maintenance means any significant remedial activity needed during the period of institutional control to maintain a reasonable assurance that the performance objectives are met. Such active maintenance includes ongoing activities such as the pumping and treatment of water from a disposal unit or one-time measures such as replacement of a disposal unit cover. Active maintenance does not include custodial activities such as repair of fencing, repair or replacement of monitoring equipment, revegetation, minor additions to soil cover, minor repair of disposal unit covers and general disposal site upkeep such as mowing grass.
- (2) Buffer zone means a portion of the disposal site that is controlled by the licensee and that lies under the disposal units and between the disposal units and the boundary of the site.
- (3) Chelating agent means amine polycarboxylic acids (e.g., EDTA, DTPA), hydroxyl-carboxylic acids and polycarboxylic acids (e.g., citric acid, carboic acid and glucinic acid).
- (4) Commencement of construction means any clearing of land, excavation or other substantial action that would adversely affect the environment of a land disposal facility. The term does not mean

(Rule 1200-2-11-.03, continued)

disposal site exploration, necessary roads for disposal site exploration, borings to determine foundation conditions or other preconstruction monitoring or testing to establish background information related to the suitability of the disposal site or the protection of environmental values.

- (5) Custodial agency means an agency of the government designated to act on behalf of the government owner of the disposal site.
- (6) Disposal means the isolation of radioactive wastes from the biosphere inhabited by man and containing his food chains by emplacement in a land disposal facility.
- (7) Disposal site means that portion of a land disposal facility which is used for disposal of waste. It consists of disposal units and a buffer zone.
- (8) Disposal unit means a discrete portion of the disposal site into which waste is placed for disposal.
- (9) Engineered barrier means a manmade structure or device that is intended to improve the land disposal facility's ability to meet the performance objectives.
- (10) Explosive material means any chemical compound, mixture or device which produces a substantial instantaneous release of gas and heat spontaneously or by contact with sparks or flame.
- (11) Hazardous waste means those wastes designated as hazardous by the Tennessee Department of Environment and Conservation, Division of Solid Waste Management.
- (12) Hydrogeologic unit means any soil or rock unit or zone which by virtue of its porosity or permeability, or lack thereof, has a distinct influence on the storage or movement of groundwater.
- (13) Inadvertent intruder means a person who might occupy the disposal site after closure and engage in normal activities, such as agriculture, dwelling construction or other pursuits in which the person might be unknowingly exposed to radiation from the waste.
- (14) Intruder barrier means a sufficient depth of cover over the waste that inhibits contact with waste and helps to ensure that radiation exposures to an inadvertent intruder will meet the performance objectives set forth in this Chapter or engineered structures that provides equivalent protection to the inadvertent intruder.
- (15) Land disposal facility means the land, buildings and equipment which are intended to be used for the disposal of radioactive wastes.
- (16) Monitoring means observing and making measurements to provide data to evaluate the performance and characteristics of the disposal site.
- (17) Pyrophoric liquid means any liquid that ignites spontaneously in dry or moist air at or below 130° F (54.5° C). A pyrophoric solid is any solid material, other than one classed as an explosive, which under normal conditions is liable to cause fires through friction, retained heat from manufacturing or processing or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious transportation, handling or disposal hazard. Included are spontaneously combustible and water-reactive materials.
- (18) Site closure and stabilization means those actions that are taken upon completion of operations that prepare the disposal site for custodial care and that assure that the disposal site will remain stable and will not need ongoing active maintenance.

(Rule 1200-2-11-.03, continued)

- (19) Stability means structural stability.
- (20) Surveillance means observation of the disposal site for purposes of visual detection of need for maintenance, custodial care, evidence of intrusion and compliance with other license and regulatory requirements.
- (21) Waste means those low-level radioactive wastes containing radioactive materials that are acceptable for disposal at a land disposal facility. For the purposes of this definition, low-level waste is radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel or byproduct material as defined in Section 11e.(2) of the Atomic Energy Act (uranium or thorium tailings and waste).

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.04 LICENSE REQUIRED

- (1) No person may receive, possess and dispose of radioactive waste containing radioactive material at a land disposal facility unless authorized by a license issued by the Department pursuant to this Chapter.
- (2) Each person shall file an application with the Department and obtain a license as provided in this Chapter before commencing construction of a land disposal facility. Failure to comply with this requirement may be grounds for denial of a license.

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.05 COMMUNICATIONS

Except where otherwise specified, all communications and reports concerning the regulations in this Chapter and applications filed under them should be addressed to the Division of Radiological Health, at the address given in 1200-2-4-.07.

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.06 RESERVED

1200-2-11-.07 RESERVED

1200-2-11-.08 CONTENT OF APPLICATION

- (1) An application to receive from others, possess and dispose of wastes containing or contaminated with radioactive material by land disposal must consist of general information, specific technical information, institutional information, and financial information, as set forth in this Chapter and Chapter 1200-2-10. An environmental report must accompany the application.
- (2) General information must include:
 - (a) Identity of the applicant including:

(Rule 1200-2-11-.08, continued)

1. The full name, address, telephone number and description of the business or occupation of the applicant;
 2. If the applicant is a partnership, the name and address of each partner and the principal location where the partnership does business;
 3. If the applicant is a corporation or an unincorporated association,
 - (i) the state where it is incorporated or organized and the principal location where it does business, and
 - (ii) the names and addresses of its directors and principal officers; and
 4. If the applicant is acting as an agent or representative of another person in filing the application, all information required under this paragraph must be supplied with respect to the other person.
- (b) Qualifications of the applicant:
1. The organizational structure of the applicant, both offsite and onsite, including a description of lines of authority and assignments of responsibilities, whether in the form of administrative directives, contract provisions or otherwise;
 2. The technical qualifications, including training and experience, of the applicant and members of the applicant's staff to engage in the proposed activities. Minimum training and experience requirements for personnel filling key positions described in (b)1. above must be provided;
 3. A description of the applicant's personnel training program; and
 4. The plan to maintain an adequate complement of trained personnel to carry out waste receipt, handling, and disposal operations in a safe manner.
- (c) A description of:
1. The location of the proposed disposal site;
 2. The general character of the proposed activities;
 3. The types and quantities of radioactive waste to be received, possessed and disposed of;
 4. Plans for use of the land disposal facility for purposes other than disposal of radioactive wastes; and
 5. The proposed facilities and equipment.
- (d) Proposed schedules for construction, receipt of waste and first emplacement of waste at the proposed land disposal facility.
- (3) Specific technical information.

(Rule 1200-2-11-.08, continued)

- (a) The specific technical information must include the following information needed for demonstration that the performance objectives and the applicable technical requirements of this Chapter will be met:
 - 1. A description of the natural and demographic disposal site characteristics as determined by disposal site selection and characterization activities. The description must include geologic, geotechnical, hydrologic, meteorologic, climatologic and biotic features of the disposal site and vicinity.
 - 2. A description of the design features of the land disposal facility and the disposal units. The description must include those design features related to infiltration of water; integrity of covers for disposal units; structural stability of backfill, wastes and covers; contact of wastes with standing water; disposal site drainage; disposal site closure and stabilization; elimination to the extent practicable of long-term disposal site maintenance; inadvertent intrusion; occupational exposures; disposal site monitoring; and adequacy of the size of the buffer zone for monitoring and potential mitigative measures.
 - 3. A description of the principal design criteria and their relationship to the performance objectives.
 - 4. A description of the design basis natural events or phenomena and their relationship to the principal design criteria.
 - 5. A description of codes and standards which the applicant has applied to the design and which will apply to construction of the land disposal facilities.
 - 6. A description of the construction and operation of the land disposal facility. The description must include as a minimum the methods of construction of disposal units; waste emplacement; the procedures for and areas of waste segregation; types of intruder barriers; onsite traffic and drainage systems; survey control program; methods and area of waste storage; and methods to control surface water and ground water access to the wastes. The description must also include a description of the methods to be employed in the handling and disposal of wastes containing chelating agents or other nonradiological substances that might affect meeting the performance objectives in this Chapter.
 - 7. A description of the disposal site closure plan, including those design features which are intended to facilitate disposal site closure and to eliminate the need for ongoing active maintenance.
 - 8. An identification of the known natural resources at the disposal site, the exploitation of which could result in inadvertent intrusion into the low-level wastes after removal of active institutional control.
 - 9. A description of the kind, amount, classification and specifications of the radioactive material proposed to be received, possessed and disposed of at the land disposal facility.
 - 10. A description of the quality control program, developed and applied by the applicant to:
 - (i) The determination of the natural characteristics of the disposal site,

(Rule 1200-2-11-.08, continued)

- (ii) The design, construction, operation and closure of the land disposal facility; and the receipt, handling, and emplacement of waste.
 - (iii) Audits and managerial controls must be included.
 - 11. A description of the radiation safety program for control and monitoring of radioactive effluents to ensure compliance with the performance objectives of this Chapter and occupational radiation exposure to ensure compliance with the requirements of Chapter 1200-2-5 and to control contamination of personnel, vehicles, equipment, buildings and the disposal site. Both routine operations and accidents must be addressed. The program description must include procedures, instrumentation, facilities and equipment.
 - 12. A description of the environmental monitoring program to provide data to evaluate potential health and environmental impacts and the plan for taking corrective measures if migration of radionuclides is indicated.
 - 13. A description of the administrative procedures that the applicant will apply to control activities at the land disposal facility.
- (b) The specific technical information must also include the following analyses needed to demonstrate that the performance objectives of this Chapter will be met:
- 1. Pathways analyzed in demonstrating protection of the general population from releases of radioactivity must include air, soil, groundwater, surface water, plant uptake and exhumation by burrowing animals. The analyses must clearly identify and differentiate between the roles performed by the natural disposal site characteristics and design features in isolating and segregating the wastes. The analyses must clearly demonstrate that there is reasonable assurance that the exposures to humans from the release of radioactivity will not exceed the limits set forth in this Chapter.
 - 2. Analyses of the protection of individuals from inadvertent intrusion must include demonstration that there is reasonable assurance the waste classification and segregation requirements will be met and that barriers to inadvertent intrusion will be provided.
 - 3. Analyses of the protection of individuals during operations must include assessments of expected exposures due to routine operations and accidents during handling, storage and disposal of waste. The analyses must provide assurance that exposures will be controlled to meet the requirements of Chapter 5.
 - 4. Analyses of the long-term stability of the disposal site and the need for ongoing active maintenance after closure must be based upon analyses of active natural processes such as erosion, mass wasting, slope failure, settlement of wastes and backfill, infiltration through covers over disposal areas and adjacent soils, and surface drainage of the disposal site. The analyses must provide assurance that there will not be a need for ongoing active maintenance of the disposal site following closure.
- (4) Institutional information must include:
- (a) A certification by the Federal or State government which owns the disposal site that the Federal or State government is prepared to accept transfer of the license or assume management control if it is the Federal government when the provisions of 1200-2-11-.14 are

(Rule 1200-2-11-.08, continued)

met, and will assume responsibility for custodial care after site closure and postclosure observation and maintenance.

- (b) Where the proposed disposal site is on land not owned by the Federal or a State government, the applicant must submit evidence that arrangements have been made for assumption of ownership in fee by the Federal or State government before the Department issues a license.
- (5) Financial information must be submitted to demonstrate that the financial qualifications of the applicant are adequate to carry out the activities for which the license is sought and meet other financial assurance requirements as specified in Chapter 1200-2-10.
- (6) Depending upon the nature of the wastes to be disposed of and the design and proposed operation of the land disposal facility, additional information may be requested by the Department.
- (7) An application for a license under this Chapter and any amendments thereto shall be filed with the Division of Radiological Health, signed by the applicant and must consist of one (1) signed original and two (2) copies.
- (8) Other copies of the application and environmental report must be retained by the applicant for distribution in accordance with written instructions from the Director, Division of Radiological Health.
- (9) The application and environmental report must be as complete as possible based on the information that is available at the time of submittal.
- (10) The applicant shall supplement its application or environmental report in a timely manner, as necessary, to permit the Department to review, prior to issuance of a license, any changes in the activities proposed to be carried out or new information regarding the proposed activities.

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.09 STANDARDS FOR ISSUANCE

- (1) A license for the receipt, possession and disposal of waste containing or contaminated with radioactive material will be issued by the Department upon finding that the issuance of the license will not constitute a risk to the health and safety of the public greater than risks from other industries, and:
 - (a) The applicant is qualified by reason of training and experience to carry out the disposal operations requested in a manner that protects health and property.
 - (b) The applicant's proposed disposal site, disposal site design, land disposal facility operations (including equipment, facilities and procedures), disposal site closure and postclosure institutional control protect the public health and safety in that they provide assurance that the general population will be protected from releases of radioactivity as specified in the performance objective in 1200-2-11-.16(2).
 - (c) The applicant's proposed disposal site, disposal site design, land disposal facility operations (including equipment, facilities and procedures), disposal site closure and postclosure institutional control protect the public health and safety in that they provide assurance that

(Rule 1200-2-11-.09, continued)

individual inadvertent intruders are protected in accordance with the performance objective in 1200-2-11-.16(3).

- (d) The applicant's proposed land disposal operations, including equipment, facilities and procedures, protect the public health and safety in that they will provide assurance that the standards for radiation protection set out in Chapter 1200-2-5 will be met.
 - (e) The applicant's proposed disposal site, disposal site design, land disposal facility operations, disposal site closure and postclosure institutional control protect the public health and safety in that they will provide assurance that long-term stability of the disposed waste and the disposal site will be achieved and will eliminate to the extent practicable the need for ongoing active maintenance of the disposal site following closure.
 - (f) The applicant's demonstration provides assurance that the applicable technical requirements of this Chapter will be met.
 - (g) The applicant's proposal for institutional control provides assurance that institutional control will be provided for the length of time found necessary to ensure the findings in paragraphs (b) through (e) of 1200-2-11-.09(1) and that the institutional control meets the requirements of 1200-2-11-.17(10).
 - (h) The information on financial assurance meets the requirements of this Chapter and Chapter 1200-2-10.
 - (i) Any additional information submitted as requested by the Department pursuant to 1200-2-11-.08(6), is adequate.
- (2) Conditions of licenses.
- (a) A license issued under this Chapter or any right thereunder, may be transferred, assigned or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of the license to any person, only if the Department finds, after securing full information, that the transfer is in accordance with the provisions of Tennessee Code Annotated Title 68 Chapter 23 and gives its consent in writing in the form of a license amendment.
 - (b) The licensee shall submit written statements under oath upon request of the Department, at any time before termination of the license, to enable the Department to determine whether or not the license should be modified, suspended or revoked.
 - (c) The license will be transferred to the site owner only on the full implementation of the final closure plan as approved by the Department, including postclosure monitoring and maintenance.
 - (d) The licensee shall be subject to the provisions of Tennessee Code Annotated now or hereafter in effect, and to all rules, regulations, and orders of the Department. The terms and conditions of the license are subject to amendment, revision or modification, by reason of amendments to or by reason of rules, regulations and orders issued in accordance with the terms of Tennessee Code Annotated Title 68 Chapter 23.
 - (e) Any license may be revoked, suspended or modified in whole or in part for any material false statement in the application or because of conditions revealed by any application or statement

(Rule 1200-2-11-.09, continued)

of fact or any report, record, or inspection or other means which would warrant the Department to refuse to grant a license to the original application, or for failure to operate the facility in accordance with the terms of the license, or for any violation of, or failure to observe any of the terms and conditions of the Act, or any rule, regulation, license or order of the Department.

- (f) Each person licensed by the Department pursuant to the regulations in this Chapter shall confine possession and use of materials to the locations and purposes authorized in the license.
- (g) No radioactive waste may be disposed of until the Department has inspected the land disposal facility and has found it to be in conformance with the description, design and construction described in the application for a license.
- (h) The Department may incorporate in any license at the time of issuance, or thereafter, additional requirements and conditions with respect to the licensee's receipt, possession and disposal of radioactive material as it deems appropriate or necessary in order to:
 - 1. Protect health and property;
 - 2. Require reports and the keeping of records and to provide for inspections of activities under the license that may be necessary or appropriate to effectuate the purposes of the Act and regulations thereunder.
- (i) The authority to dispose of wastes expires on the date stated in the license except as provided in 1200-2-11-.11(1).

(3) Changes.

- (a) Except as provided for in specific license conditions, the licensee shall not make changes in the land disposal facility or procedures described in the license application. The license will include conditions restricting subsequent changes to the facility and the procedures authorized which are important to public health and safety. These license restrictions will fall into categories of descending importance to public health and safety as follows:
 - 1. Those features and procedures which may not be changed without sixty 60 days prior notice to the Department and prior Department approval; and
 - 2. Those features and procedures which may not be changed without 60 days prior notice to the Department. Features and procedures falling in this category may not be changed without prior Department approval if the Department, after having received the required notice, so orders.
- (b) Changes in procedures contained in requests for amendments to authorize site closure, license transfer or license termination shall be included in (a)1. above.

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.10 AMENDMENT OR RENEWAL

- (1) An application for amendment of a license may be filed in accordance with 1200-2-11-.08(7) and (8) and shall fully describe the requested license amendment.

(Rule 1200-2-11-.10, continued)

- (2) In determining whether an amendment to a license will be approved, the Department will apply the criteria set forth in 1200-2-11-.09(1).

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.11 APPLICATION FOR RENEWAL OR CLOSURE

- (1) Any expiration date on a license applies only to the authority to dispose of waste. Failure to renew the license shall not relieve the licensee of responsibility for carrying out site closure, postclosure monitoring and transfer of the license to the site owner. An application for renewal or an application for closure under 1200-2-11-.12 must be filed at least 30 days prior to license expiration.
- (2) Applications for renewal of a license must be filed in accordance with 1200-2-11-.08. Applications for closure must be filed in accordance with 1200-2-11-.08(7) and (8) and 1200-2-11-.12. Unless requested otherwise, information contained in previous applications, statements or reports filed with the Department under the license may be incorporated by reference if the references are clear and specific.
- (3) In any case in which a licensee has timely filed an application for renewal of a license, the license for continued receipt and disposal of licensed materials does not expire until the Department has taken final action on the application for renewal.
- (4) In determining whether a license will be renewed, the Department will apply the criteria set forth in 1200-2-11-.09(1).

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.12 CONTENTS OF APPLICATION FOR CLOSURE

- (1) Prior to final closure of the disposal site, or as otherwise directed by the Department, the applicant shall submit an application to amend the license for closure. This closure application must include a final revision and specific details of the disposal site closure plan included as part of the license application submitted under 1200-2-11-.08(3)(a)7. that includes each of the following:
 - (a) Any additional geologic, hydrologic or other disposal site data pertinent to the long-term containment of emplaced radioactive wastes obtained during the operation period.
 - (b) The results of tests, experiments or other analyses relating to backfill of excavated areas, closure and sealing, waste migration and interaction with emplacement media, or any other tests, experiments or analysis pertinent to the long-term containment of emplaced waste within the disposal site.
 - (c) Any proposed revision of plans for:
 1. Decontamination and/or dismantlement of surface operational facilities;
 2. Backfilling of excavated areas; or
 3. Stabilization of the disposal site for postclosure care.

(Rule 1200-2-11-.12, continued)

- (d) Any significant new information regarding the environmental impact of closure activities and long-term performance of the disposal site.
- (2) Upon review and consideration of an application to amend the license for closure submitted in accordance with paragraph (1) of this Rule, the Department shall issue an amendment authorizing closure if there is assurance that the long-term performance objectives of 1200-2- 11-.16 will be met.

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.13 POST CLOSURE OBSERVATION AND MAINTENANCE

Following completion of closure authorized in 1200-2- 11-.12 the licensee shall observe, monitor and carry out necessary maintenance and repairs at the disposal site until the license is transferred by the Department in accordance with 1200-2- 11-.14. Responsibility for the disposal site must be maintained by the licensee for 5 years. A shorter or longer time period for post-closure observation and maintenance may be established and approved as part of the site closure plan, based on site-specific conditions.

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.14 TRANSFER OF LICENSE.

- (1) Following closure and the period of post-closure observation and maintenance, the licensee may apply for an amendment to transfer the license to the disposal site owner. The license shall be transferred when the Department finds:
 - (a) That the closure of the disposal site has been made in conformance with the licensee's disposal site closure plan, as amended and approved as part of the license;
 - (b) That assurance has been provided by the licensee that the performance objectives of 1200-2-11-.16 are met;
 - (c) That any funds and necessary records for care will be transferred to the disposal site owner;
 - (d) That the post-closure monitoring program is operational for implementation by the disposal site owner; and
 - (e) That the Federal or State government agency which will assume responsibility for institutional control of the disposal site is prepared to assume responsibility and ensure that the institutional requirements found necessary under 1200-2-11-.09 will be met.
- (2) Reserved

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

200-2-11-.15 TERMINATION OF LICENSE

- (1) Following any period of institutional control needed to meet the requirements found necessary under 1200-2-11-.09, the licensee may apply for an amendment to terminate the license.

(Rule 1200-2-11-.15, continued)

- (2) This application must be filed, and will be reviewed, in accordance with the provision of 1200-2-11-.08(7) and (8).
- (3) A license is terminated only when the Department finds:
 - (a) That the institutional control requirements found necessary under 1200-2-11-.09(1)(g) have been met; and
 - (b) That any additional requirements resulting from new information developed during the institutional control period have been met, and that permanent monuments or markers warning against intrusion have been installed.

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.16 PERFORMANCE OBJECTIVES

- (1) General requirement.

Land disposal facilities must be sited, designed, operated, closed and controlled after closure so that reasonable assurance exists that exposures to humans are within the limits established in the performance objectives in (2) through (5) of this Rule.

- (2) Protection of the general population from releases of radioactivity.

Concentrations of radioactive material which may be released to the general environment in ground water, surface water, air, soil, plants or animals must not result in an annual dose exceeding an equivalent of 25 millirems to the whole body, 75 millirems to the thyroid and 25 millirems to any other organ of any member of the public. Reasonable effort shall be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable.

- (3) Protection of individuals from inadvertent intrusion.

Design, operation and closure of the land disposal facility must ensure protection of any individual inadvertently intruding into the disposal site and occupying the site or contacting the waste at any time after active institutional controls over the disposal site are removed.

- (4) Protection of individuals during operations.

Operations at the land disposal facility must be conducted in compliance with the standards for radiation protection set out in Chapter 5, except for releases of radioactivity in effluents from the land disposal facility, which shall be governed by (2) of this Rule. Every reasonable effort shall be made to maintain radiation exposures as low as is reasonably achievable.

- (5) Stability of the disposal site after closure.

The disposal facility must be sited, designed, used, operated and closed to achieve long-term stability of the disposal site and to eliminate to the extent practicable the need for ongoing active maintenance of the disposal site following closure so that only surveillance, monitoring or minor custodial care are required.

(Rule 1200-2-11-.16, continued)

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.17 TECHNICAL REQUIREMENTS FOR LAND DISPOSAL FACILITIES

- (1) Disposal site suitability requirements for land disposal.
 - (a) The purpose of this section is to specify the minimum characteristics a disposal site must have to be acceptable for use as a disposal facility. The primary emphasis in disposal site suitability is given to isolation of wastes, a matter having long-term impacts and to disposal site features that ensure that the long-term performance objectives of 1200-2-11-.16 of this part are met, as opposed to short-term convenience or benefits.
 - (b) The disposal site shall be capable of being characterized, modeled, analyzed and monitored.
 - (c) Within the region where the facility is to be located, a disposal site should be selected so that projected population growth and future developments are not likely to affect the ability of the disposal facility to meet the performance objective of 1200-2-11-.16.
 - (d) Areas must be avoided having known natural resources which, if exploited, would result in failure to meet the performance objectives of 1200-2-11-.16.
 - (e) The disposal site must be generally well drained and free of areas of flooding or frequent ponding. Waste disposal shall not take place in a 100-year flood plain or wetland, as defined in Presidential executive Order 11988, "Floodplain Management Guidelines."
 - (f) Upstream drainage areas must be minimized to decrease the amount of runoff which could erode or inundate waste disposal units.
 - (g) The disposal site must provide sufficient depth to the watertable that ground water intrusion, perennial or otherwise, onto waste will not occur. The Department will consider an exception to this requirement to allow disposal below the watertable if it can be conclusively shown that disposal site characteristics will result in molecular diffusion being the predominant means of radionuclide movement and the rate of movement will result in the performance objectives of 1200-2-11-.16 being met. In no case will waste disposal be permitted in the zone of fluctuation of the water table.
 - (h) The hydrogeologic unit used for disposal shall not discharge ground water to the surface within the disposal site.
 - (i) Areas must be avoided where tectonic processes such as faulting, folding, seismic activity or vulcanism may occur with such frequency and extent to affect the ability of the disposal site to meet the performance objectives of 1200-2-11-.16, or may preclude defensible modeling and prediction of long-term impacts.
 - (j) Areas must be avoided where surface geologic processes such as mass wasting, erosion, slumping, landsliding or weathering occur with such frequency and extent to affect the ability of the disposal site to meet the performance objectives of 1200-2-11-.16, or may preclude defensible modeling and prediction of long-term impacts.

(Rule 1200-2-11-.17, continued)

- (k) The disposal site must not be located where nearby facilities or activities could impact the ability of the site to meet the performance objectives of 1200-2-11-.16 or mask the environmental monitoring program.
- (2) Disposal site design for land disposal.
- (a) Site design features must be directed toward long-term isolation and avoidance of the need for continuing active maintenance after site closure.
 - (b) The disposal site design and operation must be compatible with the disposal site closure and stabilization plan and lead to disposal site closure that provides assurance that the performance objectives of 1200-2-11-.16 will be met.
 - (c) The disposal site must be designed to complement and improve, where appropriate, the ability of the disposal site's natural characteristics to assure that the performance objectives of 1200-2-11-.16 will be met.
 - (d) Covers must be designed to minimize to the extent practicable water infiltration, to direct percolating or surface water away from the disposed waste and to resist degradation by surface geologic processes and biotic activity.
 - (e) Surface features must direct surface water drainage away from disposal units at velocities and gradients which will not result in erosion that will require ongoing active maintenance in the future.
 - (f) The disposal site must be designed to minimize to the extent practicable the contact of water with waste during storage, the contact of standing water with waste during disposal and the contact of percolating or standing water with wastes after disposal.
- (3) Land disposal facility operation and disposal site closure.
- (a) Wastes designated as Class A pursuant to (6) of this Rule must be segregated from other wastes by placing in disposal units which are sufficiently separated from disposal units for the other waste classes so that any interaction between Class A wastes and other wastes will not result in the failure to meet the performance objectives in 1200-2-11-.16. This segregation is not necessary for Class A wastes if they meet the stability requirements in (7)(b) of this Rule.
 - (b) Wastes designated as Class C pursuant to (6) of this Rule must be disposed of so that the top of the waste is a minimum of 5 meters below the top surface of the cover or must be disposed of with intruder barriers that are designed to protect against an inadvertent intrusion for at least 500 years.
 - (c) All wastes shall be disposed of in accordance with the requirements of (d) through (k) below.
 - (d) Wastes must be emplaced in a manner that maintains the package integrity during emplacement, minimizes the void spaces between packages and permits the void spaces to be filled.
 - (e) Void spaces between waste packages must be filled with earth or other material to reduce future subsidence within the disposal unit.

(Rule 1200-2-11-.17, continued)

- (f) Waste must be placed and covered in a manner that limits the radiation dose rate at the surface of the cover to levels that at a minimum will permit the licensee to comply with all provision of 1200-2-5-.60 at the time the license is transferred pursuant to 1200-2-11-.14.
 - (g) The boundaries and locations of each disposal unit must be accurately located and mapped by means of a land survey. Disposal units must be marked in such a way that the boundaries of each unit can be easily defined. Three permanent survey marker control points, referenced to United States Geological Survey (USGS) or National Geodetic Survey (NGS) survey control stations, must be established on the site to facilitate surveys. The USGS or NGS control stations must provide horizontal and vertical controls as checked against USGS or NGS record files.
 - (h) A buffer zone of land must be maintained between any disposal unit and the disposal boundary and beneath the disposed waste. The buffer zone shall be of adequate dimensions to carry out environmental monitoring activities specified in (4) of this Rule and take mitigative measures if needed.
 - (i) Closure and stabilization measures as set forth in the approved site closure plan must be carried out as each disposal unit is filled and covered.
 - (j) Active waste disposal operations must not have an adverse effect on completed closure and stabilization measures.
 - (k) Only wastes containing or contaminated with radioactive materials shall be disposed of at the disposal site.
- (4) Environmental monitoring.
- (a) At the time a license application is submitted, the applicant shall have conducted a pre-operational monitoring program to provide basic environmental data on the disposal site characteristics. The applicant shall obtain information about the ecology, metrology, climate, hydrology, geology, geochemistry and seismology of the disposal site. For those characteristics that are subject to seasonal variation, data must cover at least a twelve month period.
 - (b) The licensee must have plans for taking corrective measures if migration of radionuclides would indicate that the performance objectives of 1200-2-11-.16 may not be met.
 - (c) During the land disposal facility site construction and operation, the licensee shall maintain a monitoring program, including a monitoring system. Measurements and observations must be made and recorded to provide data to evaluate the potential health and environmental impacts during both the construction and the operation of the facility and to enable the evaluation of long-term effects and the need for mitigative measures. The monitoring system must be capable of providing early warning of releases of radionuclides from the disposal unit before they leave the site boundary.
 - (d) After the disposal site is closed, the licensee responsible for post-operational surveillance of the disposal site shall maintain a monitoring system based on the operating history and the closure and stabilization of the disposal site. The monitoring system must be capable of providing early warning of releases of radionuclides from the disposal unit before they leave the site boundary.
- (5) Alternative requirements for design and operations.

(Rule 1200-2-11-.17, continued)

The Department may, upon request or on its own initiative, authorize provisions other than those set forth in (2), (3) and (4) of this Rule for the segregation and disposal of waste and for the design and operation of a land disposal facility on a specific basis, if it finds assurance of compliance with the performance objectives of 1200-2-11-.16.

(6) Waste Classification.

(a) Determination of the classification of radioactive waste involves two considerations. First, consideration must be given to the concentration of long-lived radionuclides (and their short-lived precursors) whose potential hazard will persist long after such precautions as institutional controls, improved waste form and deeper disposal have ceased to be effective. These precautions delay the time when long-lived radionuclides could cause exposures. In addition, the magnitude of the potential dose is limited by the concentration and availability of the radionuclide at the time of exposure. Second, consideration must be given to the concentration of shorter-lived radionuclides for which requirements on institutional controls, waste form and disposal methods are effective.

(b) Classes of waste.

1. Class A waste is waste that is usually segregated from other waste classes at the disposal site. The physical form and characteristics of Class A waste must meet the minimum requirements set forth in (7)(a) of this Rule. If Class A waste also meets the stability requirements set forth in (7)(b) of this Rule, it is not necessary to segregate the waste for disposal.
2. Class B waste is waste that must meet more rigorous requirements on waste form to ensure stability after disposal. The physical form and characteristics of Class B waste must meet both the minimum and stability requirements set forth in (7) of this Rule.
3. Class C waste is waste that not only must meet more rigorous requirements on waste form to ensure stability but also requires additional measures at the disposal facility to protect against inadvertent intrusion. The physical form and characteristics of Class C waste must meet both the minimum and stability requirements set forth in (7) of this Rule.
4. Waste that is not acceptable for disposal is waste for which waste form and disposal methods must be different and, in general, more stringent than those specified for Class C waste. In the absence of specific requirements in this Chapter, proposals for disposal of this waste may be submitted to the Department for approval, pursuant to (9) of this Rule.

(c) If radioactive waste contains only radionuclides listed in Table 1, classification shall be determined as follows:

1. If the concentration does not exceed 0.1 times the value in Table 1, the waste is Class A.
2. If the concentration exceeds 0.1 times the value in Table 1 but does not exceed the value in Table 1, the waste is Class C.
3. If the concentration exceeds the value in Table 1, the waste is not acceptable for disposal, except under (6)(b)4. of this Rule.

(Rule 1200-2-11-.17, continued)

4. For wastes containing mixtures of radionuclides listed in Table 1, the total concentration shall be determined by the sum of fractions rule described in (6)(g) of this Rule.

Table 1	
Radionuclide	Concentration curies per cubic meter
C-14	8
C-14 in activated metal	80
Ni-59 in activated metal	220
Nb-94 in activated metal	0.2
Tc-99	3
I-129	0.08
Alpha emitting transuranic nuclides with half-life greater than five (5) years	100 ¹
Pu-241	3,500 ¹
Cm-242	20,000 ¹

¹ Units are nanocuries per gram.

- (d) If radioactive waste does not contain any of the radionuclides listed in Table 1, classification shall be determined based on the concentrations shown in Table 2. However, as specified in (f) of this paragraph, if radioactive waste does not contain any nuclides listed in either Table 1 or 2, it is Class A.
 1. If the concentration does not exceed the value in Column 1, the waste is Class A.
 2. If the concentration exceeds the value in Column 1, but does not exceed the value in Column 2, the waste is Class B.
 3. If the concentration exceeds the value in Column 2, but does not exceed the value in Column 3, the waste is Class C.
 4. If the concentration exceeds the value in Column 3, the waste is not acceptable for disposal, except under (6)(b)4. of this Rule.
 5. For wastes containing mixtures of the nuclides listed in Table 2, the total concentration shall be determined by the sum of fractions rule described in (g) of this paragraph.

(Rule 1200-2-11-.17, continued)

Table 2			
Concentration, curies per cubic meter			
Radionuclide	Col. 1	Col. 2	Col. 3
Total of all nuclides with less than 5 year half life	700	(¹)	(¹)
H-3	40	(¹)	(¹)
Co-60	700	(¹)	(¹)
Ni-63	3.5	70	700
Ni-63 in activated metal	35	700	7000
Sr-90	0.04	150	7000
Cs-137	1	44	4600

¹ There are no limits established for these radionuclides in Class B or C wastes. Practical considerations such as the effects of external radiation and internal heat generation on transportation, handling and disposal will limit the concentrations for these wastes. These wastes shall be Class B unless the concentrations of other nuclides in Table 2 determine the waste to be Class C independent of these nuclides.

- (e) If radioactive waste contains a mixture of radionuclides, some of which are listed in Table 1 and some of which are listed in Table 2, classification shall be determined as follows:
 - 1. If the concentration of a nuclide listed in Table 1 does not exceed 0.1 times the value listed in Table 1, the class shall be that determined by the concentration of nuclides listed in Table 2.
 - 2. If the concentration of a nuclide listed in Table 1 exceeds 0.1 times the value listed in Table 1 but does not exceed the value in Table 1, the waste shall be Class C, provided the concentration of nuclides listed in Table 2 does not exceed the value shown in Column 3 of Table 2.
- (f) If radioactive waste does not contain any nuclides listed in either Table 1 or 2, it is Class A.
- (g) For determining classification for waste that contains a mixture of radionuclides, it is necessary to determine the sum of fractions by dividing each nuclide's concentration by the appropriate limit and adding the resulting values. The appropriate limits must all be taken from the same column of the same table. The sum of the fractions for the column must be less than 1.0 if the waste class is to be determined by that column. Example: a waste contains Sr-90 in a concentration of 50 Ci/m³ and Cs-137 in a concentration of 22 Ci/m³. Since the concentrations both exceed the values in Column 1, Table 2, they must be compared to Column 2 values. For Sr-90 fraction, $50/150 = 0.33$; for Cs-137 fraction, $22/44 = 0.5$; the sum of the fractions = 0.83. Since the sum is less than 1.0, the waste is Class B.
- (h) The concentration of a radionuclide may be determined by indirect methods such as use of scaling factors which relate the inferred concentration of one radionuclide to another that is measured, or radionuclide material accountability, if there is assurance that the indirect methods can be correlated with actual measurements. The concentration of a radionuclide may

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be averaged over the volume of the waste, or weight of the waste if the units are expressed as nanocuries per gram.

(7) Waste characteristics.

(a) The following requirements are minimum requirements for all classes of waste and are intended to facilitate handling at the disposal site and provide protection of health and safety of personnel at the disposal site.

1. Waste must not be packaged for disposal in cardboard or fiberboard boxes.
2. Liquid waste must be solidified or packaged in sufficient absorbent material to absorb twice the volume of the liquid.
3. Solid waste containing liquid shall contain as little free standing and noncorrosive liquid as is reasonably achievable, but in no case shall the liquid exceed one (1) percent of the volume.
4. Waste must not be capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures or of explosive reaction with water.
5. Waste must not contain, or be capable of generating, quantities of toxic gases, vapors or fumes harmful to persons transporting, handling or disposing of the waste. This does not apply to radioactive gaseous waste packaged in accordance with (a)7 of this paragraph.
6. Waste must not be pyrophoric. Pyrophoric materials contained in waste shall be treated, prepared and packaged to be nonflammable.
7. Waste in a gaseous form must be packaged at a pressure that does not exceed 1.5 atmospheres at 20o C. Total activity must not exceed 100 curies per container.
8. Waste containing hazardous, biological, pathogenic or infectious material must be treated to reduce to the maximum extent practicable the potential hazard from the non-radiological materials.

(b) The requirements in this paragraph are intended to provide stability of the waste. Stability is intended to ensure that the waste does not structurally degrade and affect overall stability of the site through slumping, collapse or other failure of the disposal unit and thereby lead to water infiltration. Stability is also a factor in limiting exposure to an inadvertent intruder, since it provides a recognizable and nondispersible waste.

1. Waste must have structural stability. A structurally stable waste form will maintain its physical dimensions and its form, under the expected disposal conditions such as weight of overburden and compaction equipment, the presence of moisture, and microbial activity and internal factors such as radiation effects and chemical changes. Structural stability can be provided by the waste form itself, processing the waste to a stable form or placing the waste in a disposal container or structure that provides stability after disposal.
2. Notwithstanding the provisions in 1200-2-11-.17(7)(a)2 and 3, liquid wastes, or wastes containing liquid, must be converted into a form that contains as little free standing and

(Rule 1200-2-11-.17, continued)

noncorrosive liquid as is reasonably achievable, but in no case shall the liquid exceed one (1) percent of the volume of the waste when the waste is in a disposal container designed to ensure stability, or one-half (0.5) percent of the volume of the waste for waste processed to a stable form.

3. Void spaces within the waste and between the waste and its package must be reduced to the extent practicable.

(8) Labeling.

Each package of waste must be clearly labeled to identify whether it is Class A waste, Class B waste or Class C waste in accordance with (6) of this Rule.

(9) Alternative requirements for waste classification characteristics.

The Department may, upon request or on its own initiative, authorize other provisions for the classification and characteristics of waste on a specific basis, if, after evaluation of the specific characteristics of the waste, disposal site and method of disposal, it finds assurance of compliance with the performance objectives in 1200-2-11-.16.

(10) Institutional requirements.

- (a) Disposal of radioactive waste received from other persons may be permitted only on land owned in fee by the Federal or State government.
- (b) The land owner or custodial agency shall carry out an institutional control program to physically control access to the disposal site following transfer of control of the disposal site from the disposal site operator. The institutional control program must also include, but not be limited to, carrying out an environmental monitoring program at the disposal site, periodic surveillance, minor custodial care, and other requirements as determined by the Department; and administration of funds to cover the costs for these activities. The period of institutional controls will be determined by the Department, but institutional controls may not be relied upon for more than 100 years following transfer of control of the disposal site to the owner.

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.18 FINANCIAL ASSURANCE

Each applicant shall provide for financial assurance in accordance with 1200-2-10-.12(4) and (5) and this Chapter.

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.

1200-2-11-.19 RECORDS, REPORTS, TESTS AND INSPECTIONS

(1) Maintenance of records, reports and transfers.

- (a) Each licensee shall maintain any records and make any reports in connection with the licensed activities as may be required by the conditions of the license or by the rules, regulations, and orders of the Department.

(Rule 1200-2-11-.19, continued)

- (b) Records which are required by the regulations or by license conditions must be maintained for a period specified by the appropriate regulations or by license condition. If a retention period is not otherwise specified, these records must be maintained and transferred to the officials specified in (e) of this paragraph as a condition of license termination unless the Department otherwise authorizes their disposition.
- (c) Records which must be maintained may be the original or a reproduced copy or microfilm if this reproduced copy or microfilm is capable of producing copy that is clear and legible at the end of the required retention period.
- (d) If there is a conflict between the Department regulations, license condition, or other written Department approval or authorization pertaining to the retention period of the same type of record, the longest retention period specified takes precedence.
- (e) Notwithstanding (a) through (d) of this paragraph, copies of records of the location and the quantity of radioactive wastes contained in the disposal site must be transferred upon license termination to the chief executive of the nearest municipality, the chief executive of the county in which the facility is located, the county zoning board or land development and planning agency, the State governor and other State and local governmental agencies as designated by the Department at the time of license termination.
- (f) Following receipt and acceptance of a shipment of radioactive waste, the licensee shall record the date of disposal of the waste, the location in the disposal site, the condition of the waste packages as received, any discrepancies between materials listed on the manifest and those received, and any evidence of leaking or damaged packages or radiation or contamination levels in excess of limits specified in U.S. Department of Transportation and Department regulations. The licensee shall briefly describe any repackaging operations of any of the waste packages included in the shipment, plus any other information required by the Department as a license condition.
- (g) Each licensee authorized to dispose of radioactive waste received from other persons shall file a copy of its financial report or a certified financial statement annually with the Department in order to update the information base for determining financial assurances.
- (h) Reports shall be submitted by the end of the first calendar quarter of each year for the preceding year. The reports shall include:
 - 1. Specification of the quantity of each of the principal radionuclides released to unrestricted areas in liquid and in airborne effluents during the preceding year;
 - 2. The results of the environmental monitoring program;
 - 3. A summary of licensee disposal unit survey and maintenance activities;
 - 4. A summary, by waste class, of activities and quantities of radionuclides disposed of;
 - 5. Any instances in which observed site characteristics were significantly different from those described in the application for a license; and
 - 6. Any other information the Department may require.

(Rule 1200-2-11-.19, continued)

If the quantities of radioactive materials released during the reporting period, monitoring results or maintenance performed are significantly different from those expected in the materials previously reviewed as part of the licensing action, the report must cover this specifically.

- (i) Any transfer of radioactive materials by the licensee is subject to the requirements in these regulations.
- (2) Tests at land disposal facilities.
 - (a) Each licensee shall perform, or permit the Department to perform if the Department requests, any tests as the Department deems appropriate or necessary for the administration of these regulations, including tests of:
 - 1. Radioactive wastes and facilities used for the receipt, storage, treatment, handling and disposal of radioactive wastes,
 - 2. Radiation detection and monitoring instruments; and
 - 3. Other equipment and devices used in connection with the receipt, possession, handling, treatment, storage or disposal of radioactive waste.
 - (b) Reserved.
- (3) Inspections of land disposal facilities.
 - (a) Each licensee shall afford to the Department at all reasonable times opportunity to inspect radioactive waste not yet disposed of, and the premises, equipment, operations and facilities in which radioactive wastes are received, possessed, handled, treated, stored or disposed of.
 - (b) Each licensee shall make available to the Department for inspection, upon reasonable notice, records kept by it pursuant to these regulations. Authorized representatives of the Department may copy and take away copies of, for the Department's use, any record kept pursuant to achieving compliance with these regulations.

Authority: T.C.A. §68-23-206 and 4-5-202. **Administrative History:** Original rule filed July 11, 1988; effective August 25, 1988.